EVALUATION OF THE MACRO-NUTRIENT STATUS OF THE CURRENT FIELD PRACTICAL TRAINING (305) EXPERIMENTAL FARMSITE,

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ABSTRACT

The current 305 Field Practical Training Farm site of the Faculty of Agriculture, University of Benin (Ugbowo), Benin City, Edo state in Nigeria was selected for the study. It has been used for cropping (sole and intercropping) over 12 years were analyzed chemically for the evaluation of basic soil parameters viz., pH, EC, OC and macronutrients such as N, P,K and S by using standard methods. Five locations were selected and five different composite samples for the five locations (0-15cm) each were taken and bulked into five. These were further analyzed for chemical properties and available N, P, K and S status. Results revealed that the soil was low in nutrient when compared to critical levels The Organic carbon, available N, Ca and K were low while the P content was high. The available S was quite high ranging from 5.88-10.47mg/kg.

pH values were acidic within the range (4.6-5.6) while organic carbon percentage ranged from 1.02-1.57% in surface soils and increased with increasing depth. The Electrical Conductivity (EC) level ranged from 48.70-208g/kg. The concentration of the exchangeable cations were all in a decreasing order of magnitude; Ca++ >Mg++>Na+>K+. The percentage Base Saturation were generally low and rarely exceeding 28%. Available phosphorus ranged from 1.55-20.20mg/kg. Total Nitrogen 0.02-0.09% while exchange-acidity ranged from 0.05-1.00Cmol/kg. However, adequate measures are required to enrich the status of the top soil to increase productivity.

CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND TO STUDY

Soil fertility is one of the important factors controlling yields of the crops. Introduction of high yielding varieties (HYV) in Nigeria Agriculture in mid-sixties compelled the farmers to use high doses of NPK fertilizers. These are needed in relatively large amounts. The soil must supply macronutrients for desired growth of plants and synthesis of human food. However, exploitive nature of modern agriculture involving use of organic manures and less recycling of crop residues are important factors contributing towards accelerated exhaustion of macronutrients from the soil. The deficiencies of macronutrients have become major constraints to productivity, stability and sustainability of soils. Soils with finer particles and with higher organic matter can generally provide a greater reserve of these elements whereas, coarse textured soils such as, sand have fewer reserves and tend to get depleted rather quickly.

Soil characterization in relation to evaluation of fertility status of the soils of an area or region is an important aspect in context of sustainable agricultural production. Nitrogen, phosphorus, potassium and sulphur are important soil elements that control its fertility and yields of the crops. Because of imbalanced and inadequate fertilizer use coupled with low efficiency of other inputs, the response (production) efficiency of chemical fertilizer nutrients has declined tremendously under intensive agriculture in recent years. Variation in nutrient supply is natural phenomenon and some of them may be sufficient where others deficient. The stagnation in crop productivity cannot be boosted without judicious use of macronutrient fertilizers to overcome existing deficiencies/imbalances.

1.2 STATEMENT OF PROBLEM

Soil macronutrients (i.e., Nitrogen (N), phosphorus (P), and potassium (K)) are essential to plants (H. Marschner, 1995). They provide nutrients necessary for plant growth, which are important to maintain ecosystems and high crop yields. However, macronutrients, particularly N, and P can be potentially hazardous to water resources when their available components in soils are excessive, because available macronutrients can be transported off site in runoff due to rain or irrigation (T. Matoh, (2004), V. H. Smith,etal (1998). Improper or excessive fertilization has increasingly become a serious problem and the eutrophication problem caused by the losses of N and P from farmland to water bodies has caught people's attentions (A. Sharpley, (1995), Y. Chen,etal(2010). Therefore, proper management of soil N, P, and K is necessary to avoid deteriorating the environment while meeting the requirement of high crop productivity. In addition, reducing the losses of macronutrients from farmland also can save the costs spent on fertilizers.

Most of macronutrient contents exist in fixed forms in soils (e.g., contained in organic matter and minerals) and thus cannot be directly utilized by plants or transported to water bodies. Part of fertilizers applied to soil also can be fixed by soil and thus become unavailable to plants. This means that the total content of a macronutrient in soil is only a potentially available content in a long term, rather than its currently available content. Apparently the total content and the available content of a macronutrient are two different measures for the macronutrient in soil, and it is the availability ratio (i.e., available concentration/total concentration) that represents the potential effectiveness of a specific macronutrient in soil. That is to say, all the three indices may be necessary to understand the general situation of a macronutrient in soil. It is, therefore, important to investigate the spatial variability of availability ratios of soil macronutrients and

corresponding controlling factors so that proper measures may be taken to modify the availability of the macronutrients for site-specific management.

The information on availability of macro nutrients of the study area is meager. Therefore, the present study was undertaken to know the macro nutrients status of soils of the Current Field Practical Training (305) Farm site of the Faculty of Agriculture, University of Benin (Ugbowo), Benin City, Edo state in Nigeria and an attempt was also made to correlate macro nutrients content of the soils with other soil properties.

1.3 **OBJECTIVES OF THE STUDY**

The main objective of this research study is basically to evaluate the macronutrient status of the Current Field Practical Training (305) Experimental Farm site soils of the University of Benin (Ugbowo Campus) in Benin City, Edo state in Nigeria. To achieve the main objective; these are the following specific objectives;

i. Evaluate the macro-nutrients status of the soils on the farm site in the study area.
ii. Ascertain what macro-nutrients is suppose to be sufficient or low for plant growth, survival and optimal yield in the study area.
iii. Quantify the fertility of the soil in the study area.

1.4 **JUSTIFICATION OF THE STUDY**

Soils play an important role to describe the economical growth of the study area.

Soil fertility evaluation of an area or region is an important aspect in context of sustainable agricultural production. The macro nutrients govern the fertility of the soils and control the yields of crops. One of the most important keys to a productive pasture is good soil fertility. Nutrients are used by plants to perform a number of functions necessary to complete their life cycles. Certain nutrients called **essential nutrients** are required by the plant; the plant **cannot**

carry out normal growth without each and every one of them being present in adequate amounts. Macronutrients are required by plants in greater amounts than micronutrients due to their functions. Macronutrients are used in building tissues and proteins within a plant, which make up the bulk of it. Nutrients are constantly being removed from the soil. They can be lost by plant uptake, leaching through the soil profile, and erosion. In some cases, many of these elements may already be present but are tied up by soil particles, making them unavailable to plants.

Some soil types may be naturally high in one element but low in another. Generally, the mineral nutrients which are used the most (i.e. macronutrients) will need to be added most frequently. Also, some nutrients are more mobile in the soil than others. This results in a loss by leaching and reiterates the importance of proper application rates, as these types of nutrients may affect groundwater if they are over-applied.